UNDERSTANDING YOUR FOOD
the ultimate educational resource

TEACHER NOTES

AO2. Fats

This exercise revises information on the structure of fats and encourages pupils to improve their diet with respect to fats. Some pupils may be over concerned with their weight. Pupil sheets A02M and A02F show ranges of heights and weights for young people between the ages of 5-18. These could provide data for group or class discussions.

Answers to questions on Pupil sheets AO2:

1. A bar chart is the most suitable method of displaying the information.
2. To calculate the angles required to produce a pie chart, e.g. for beef fat:

   saturated fatty acids 55/100 x 360 = 198°

   monounsaturated fatty acids 40/100 x 360 = 144°

   polyunsaturated fatty acids 5/100 x 360 = 18°
3. Lard is pig fat.
4. Herring oil (from fish) has a relatively low % of saturated fatty acids.

   Coconut oil has a relatively high % of saturated fatty acids. (Pupils could give answers that referred to correspondingly low % of unsaturated fatty acids.)
5. Olive oil, maize (corn) oil and herring oil have the greatest % of total unsaturated fatty acids and would be expected to go rancid most quickly.
6. Answers will vary according to chosen foods. Antioxidants are used in these foods to prevent the fat in the food reacting with oxygen (prevent oxidation) to produce **rancidity**.

KS4
science and food technology

Timing - 30 minutes

possible homework exercises

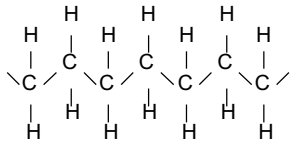
Two pupil activity sheets AO2 accompany this activity, plus optional sheets A02M and A02F.

Requirements
- *graph paper*
- *compass for drawing circles*
- *protractor (angle measurer)*

pupil activity A02

A great variety of **fats** are present in our foods, such as butter, lard, olive oil and suet. All fats have very similar structures. Each molecule of a fat is made from one molecule of a simple substance called **glycerol** joined to three molecules of substances called **fatty acids**. Fats may be described as **triglycerides**. Fats are also sometimes called *lipids.*

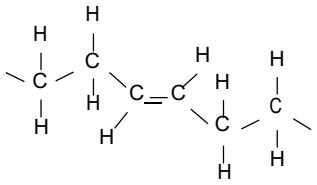
The fatty acid part of the fat molecule contains a long chain of carbon atoms to which hydrogen atoms are attached.



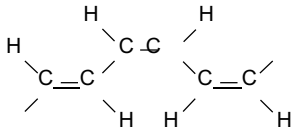
a saturated molecule

If each carbon atom is attached to its full amount of hydrogen atoms, the resulting molecule is said to be **saturated**. Molecules of saturated fat contain only carbon to carbon single bonds.

When one or more pairs of hydrogen atoms are missing from neighbouring carbon atoms, the resulting molecule is said to be **unsaturated**. Unsaturated molecules will have some double bonds between the carbon atoms. When one pair of hydrogen atoms is missing the fatty acid is said to be **monounsaturated**. When two or more pairs of hydrogen atoms are missing the fatty acid is said to be **polyunsaturated**.



Monounsaturated



Polyunsaturated

Whether or not fats contain saturated or unsaturated fatty acids is of considerable importance. The more saturated a fat is, the harder the fat tends to be. Fats which are from animal sources tend to be saturated and harder, though there are exceptions. The more unsaturated a fat is, the softer it is and oils may be formed. Fats from plant sources tend to be unsaturated and softer, though there are exceptions here as well.

Medical evidence suggests that the saturated fats are also associated with a higher risk of circulatory and heart problems. We are advised in general to cut down on the amount of fat we consume. When we do eat fats we are advised to use the monounsaturated or polyunsaturated fats.

Unfortunately, for the food industry and the home, the unsaturated fats are more susceptible to attack by oxygen. In other words they are more prone to **oxidation**. When fats undergo oxidation they produce unpleasant and sometimes harmful substances that make the fat **rancid**. There are many substances which are used as **antioxidants** in food processing to delay the process of oxidation.

Oxidation reactions in the body, except those associated with the release of energy in respiration, can lead to heart and circulatory problems. The consumption of antioxidants in foods may help to reduce this.

FATS

pupil activity A02

The table shows the composition of some fats and oils with respect to saturated, monounsaturated and polyunsaturated fatty acids. These figures are typical, average figures. It must be remembered that the composition of fats, even from the same source, will vary considerably.

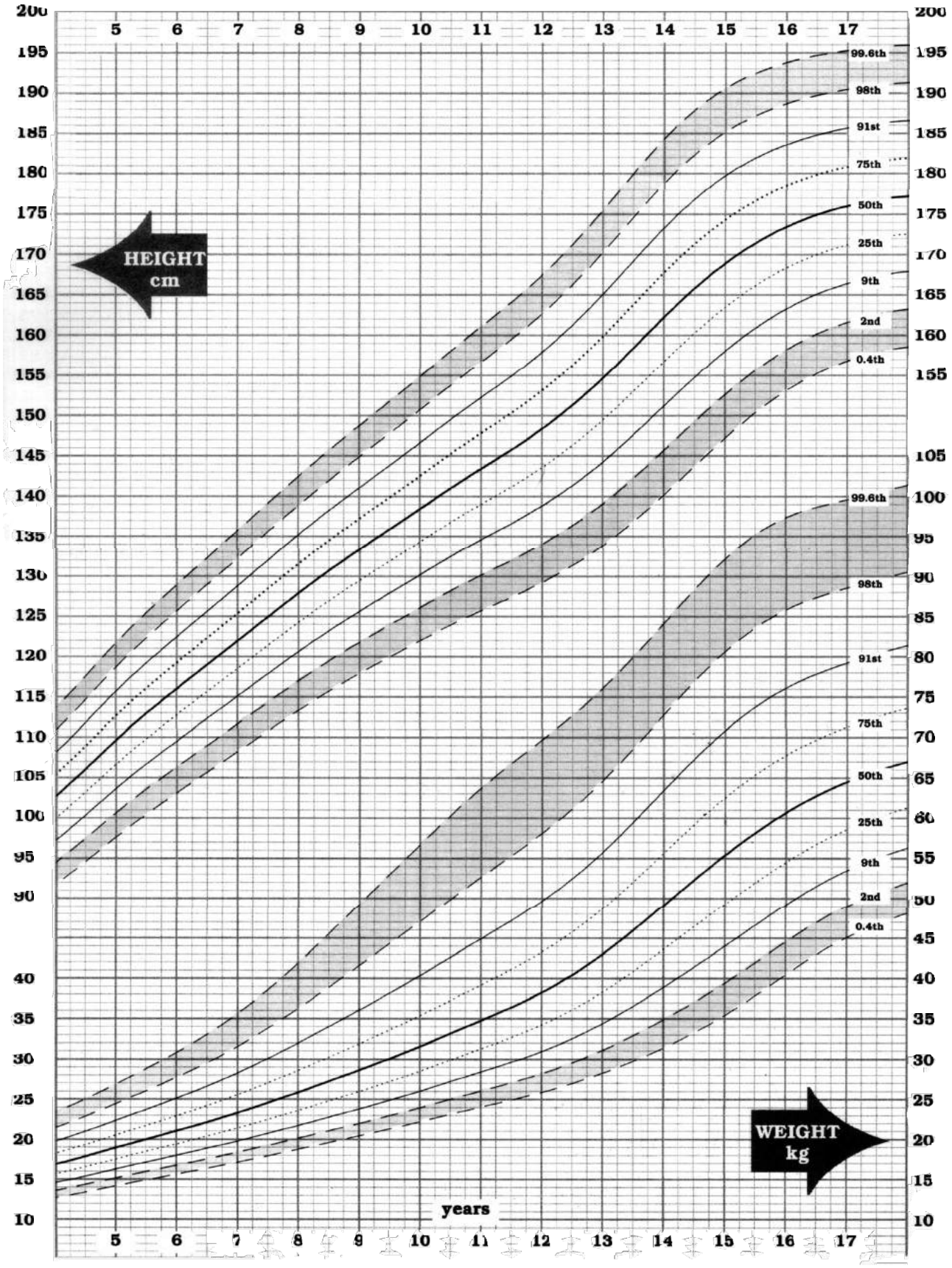
	% saturated fatty acids	% monounsaturated fatty acids	% polyunsaturated fatty acids
beef fat	55	40	5
lard	43	48	9
cow's milk fat	70	27	3
human milk fat	44	43	12
herring oil	21	65	14
maize (corn) oil	17	34	49
cocoa butter	65	32	3
coconut oil	94	5	1
palm oil	55	34	11
olive oil	14	79	6

1. Present the figures in the table as a suitable graph.
2. Choose two of the fats from the table. Show the % of saturated, monounsaturated and polyunsaturated fatty acids present in each of these fats as two separate pie charts.
3. Where does lard come from?
4. Read the information from the third paragraph again. From the table, which animal fat seems to be an exception to the rule? Which plant fat seems to be an exception?
5. Name a fat from the table which you think would go rancid quickly. Explain why you have chosen this fat.
6. Using food labels, find the names of three foods which contain an **antioxidant**. Write down the names of the foods, the names of the antioxidants and their E-numbers.

   Explain why antioxidants are used in foods.

pupil activity A02M

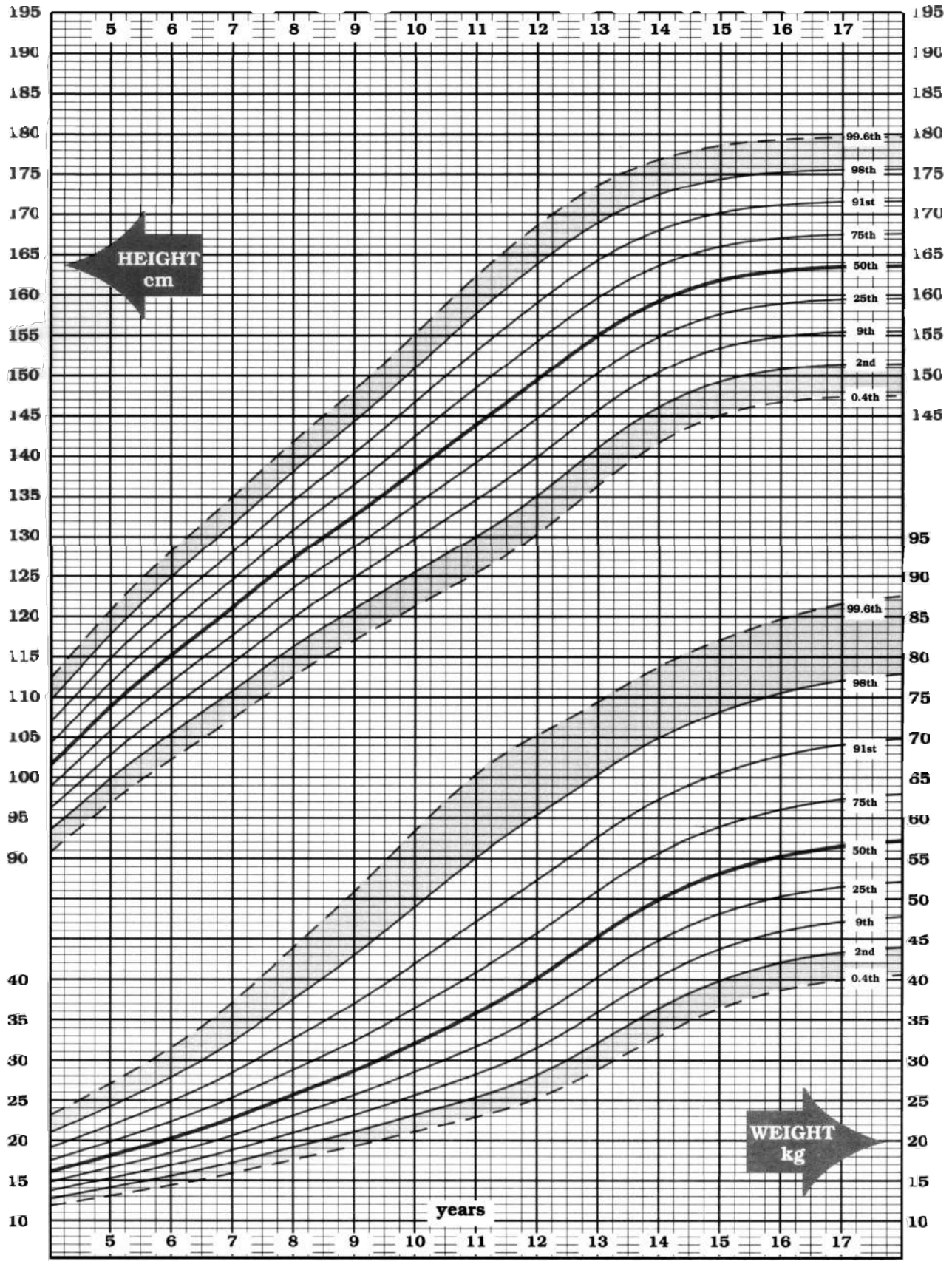
HEIGHT AND WEIGHT CHART (MALE)



Source: Adapted from Child Growth Foundation charts

HEIGHT AND WEIGHT CHART (FEMALE)

pupil activity A02F



Source: Adapted from Child Growth Foundation charts